COLLEGE OF ENGINEERING & TECHNOLOGY

BGSBU (Rajouri)

SEMINAR PRESENTATION ON **SIGHT DISTANCE**

Submitted in partial fulfillment of the requirement for the award of Bachelor's Degree in CIVIL ENGINEERING by:

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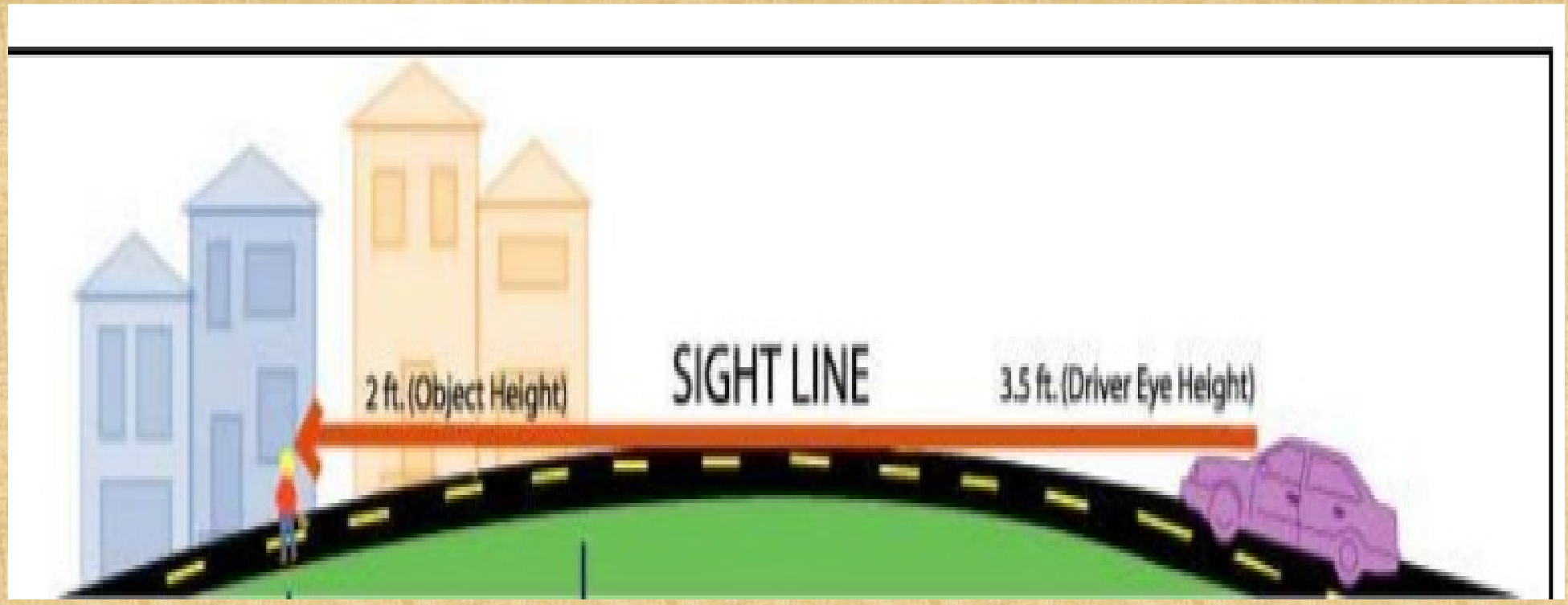
Background

- Transportation Research Board

This paper examines the development of stopping sight distance (SSD) methodology over the past 75 years. Publications between 1914 and 1940 show that sight distance became increasingly important, but that it was not thoroughly understood. The emphasis during this period was on letting drivers see other vehicles in sufficient time to take evasive action. This concept changed drastically with the 1940 publication of AASHO's classic methodology, which made specific reference to objects, eye heights, and driver perception and reaction times. Evidence shows that the new procedures were gradually assimilated into the design

➢ SIGHT DISTANCE

Def- It is the length of road visible ahead of the driver at any instant. Thus the geometrical design of the road should be done such that any observation on the road length could be visible to the driver from some distance ahead . This distance is said to be sight distance.



The standards for sight distance should satisfy the following conditions:

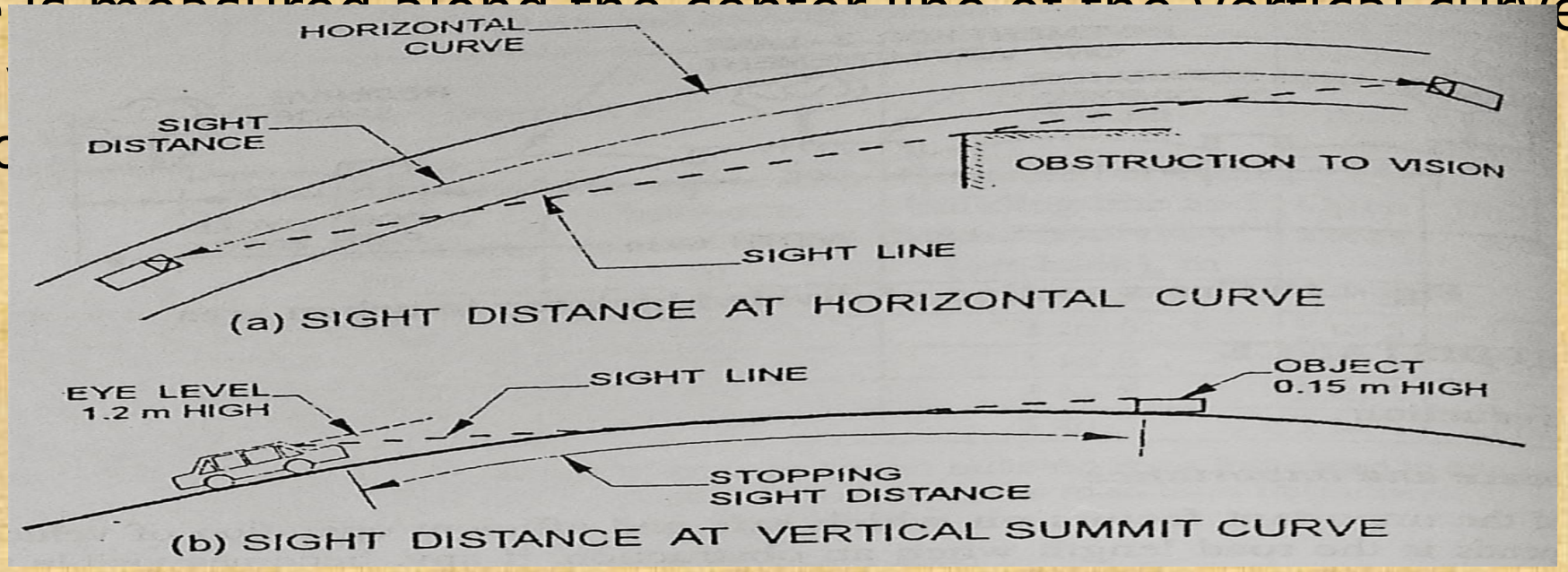
- Driver travelling at the design speed has sufficient sight distance or road length visible to stop vehicle, in case of any obstruction on the road ahead, without collision.
- Driver travelling ahead should be able to overtake slow moving vehicles, at reasonable intervals, without causing obstruction or hazard to traffic of opposite direction.
- The driver entering a uncontrolled intersection, he should have sufficient visibility to enable him to control his vehicle in order to avoid collision with another vehicle.

What is the importance of sight distance?

Adequate sight distance provides drivers with sufficient time to identify and appropriately react to all elements of the road environment, including other road users and hazards. Sight distances are particularly important in areas where pedestrians and bicyclists are known to cross the road.

Restriction to sight distance

1. At horizontal curve, when the line of sight is obstructed by objects at inner sides of the curve as shown in figure (a). Here the sight distance is measured along the center line of horizontal curve when the vehicle driver is able to see another vehicle or object on the carriageway.
2. At vertical curve the line of sight is obstructed by the road surface of the summit curve (i.e a vertical curve of the road with convexity upwards) as shown in fig (b). Here the sight distance is measured along the center line of the vertical curve when the vehicle dri is able to



➢The computation of sight distance

The computation of sight distance depends on :

1. Reaction time of the driver
2. Speed of the vehicle
3. Efficiency of brakes
4. Friction resistance between the tires and the road
5. Gradient of the road

(1) The total reaction time of the driver

The total reaction time of a driver is the time from the instance the obstruction is visible to the driver to the instance when he effectively applies the break.

Total time required for stopping within the stopping sight distance can be phased into two parts

a) Perception time
b) Brake reaction time

Perception time is the time taken by the driver to realize that there is an obstruction on the road.

Brake reaction time is the time taken by the driver to effectively apply the brakes. This depends upon the skills of the driver, the friction of the tyre and road surface and the brake efficiency.

Total reaction time may be explained with the help of PIEV theory

PERCEPTION TIME is the time required for the sensation received by the eyes or ears of the driver to be transmitted to the brain through the nervous system and spinal cord

INTELECTION TIME is the time required for the driver to understand the situation

INTELLECTION TIME is the time elapsed during emotional sensation and other mental disturbance such as fear ,anger or any other emotional feeling like superstition etc

VOILATION TIME is the time taken by the driver for the final action such as brake application

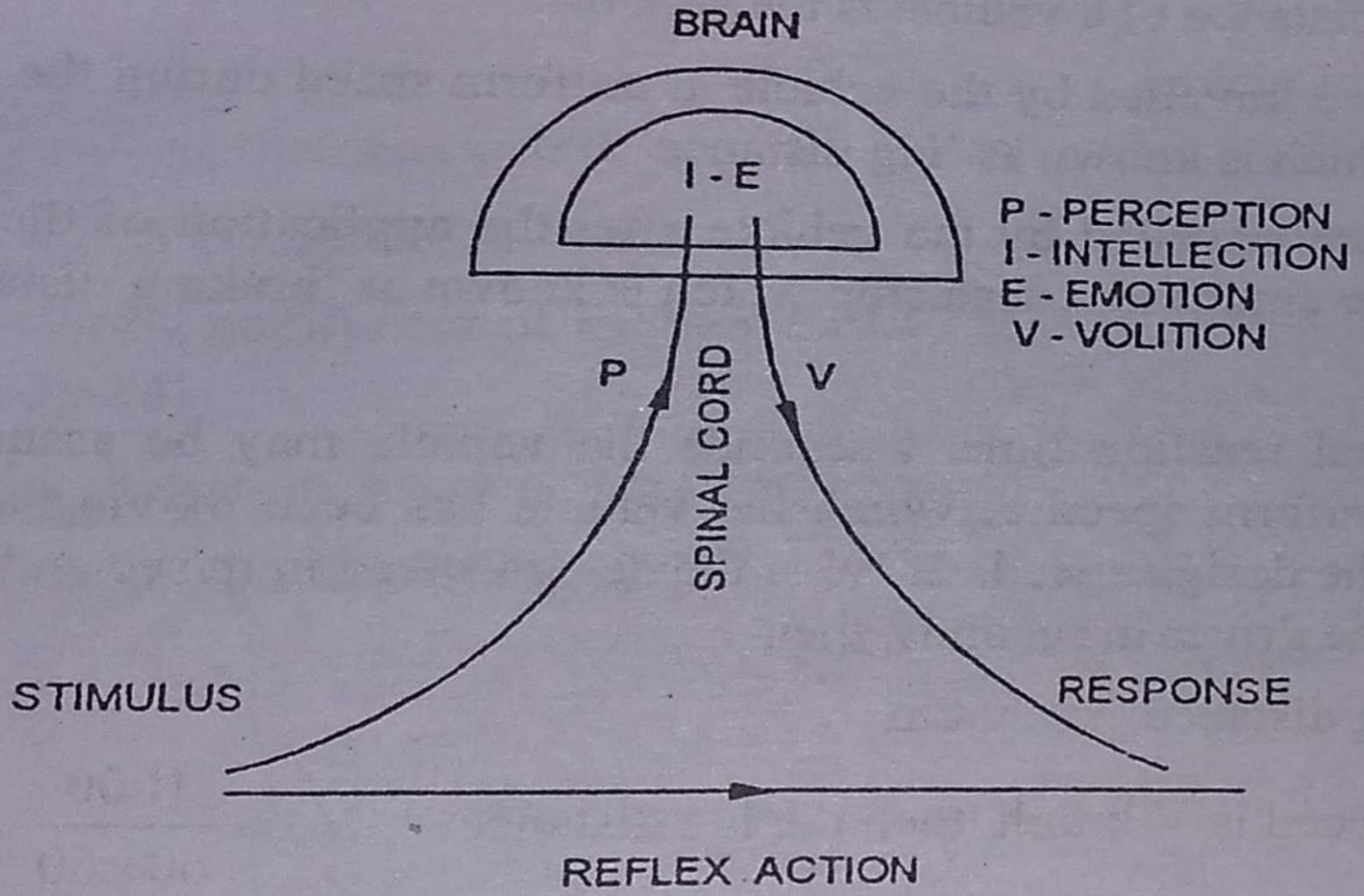


Fig. 4.12 Reaction time and 'PIEV' process

(2) Speed of the vehicle

The stopping distance depends very much on the speed of the vehicle .
First, during the total reaction time of the friver the distance moved by the vehicle will depend on the speed.
Second, the breaking distance or the distance moved by the vehicle after applying the brakes, before coming to stop depends also on the initial speed of the vehicle.
Hence, it is evident that higher the speed, higher will be the stopping distance.

(3) The Friction between the Tyre and the road surface

The friction between the Tyre and the road surface depends upon-

- the type of road surface
- the condition of the tyre
- the speed of the vehicle
- More the friction, less will the stopping sight distance but, if less is the friction, more will be the stopping sight distance

(4) Brake Efficiency

The braking efficiency is said to be 100 percent if the wheels are fully locked preventing them from rotating on application of the brakes. This will result in 100 percent skidding which is normally undesirable, except in utmost emergency. Also skidding is considered to be dangerous, as it is not possibe for the driver to easily control a vehicle after it starts skidding. Hence to avoid skid, the braking forces should not exceed the frictional force between the wheels and tyres.

(5) The Gradient of the road

The gradient may be positive or negative and accordingly, the required stopping sight distance will be less and more respectively. In the case of the upward(positive)
gradient, a component of the gravity force will be in the same direction to the direction og friction force so this will decrease the stopping sight distance.

Types of sight distance

1. Stopping sight distance (SSD) or absolute minimum sight distance

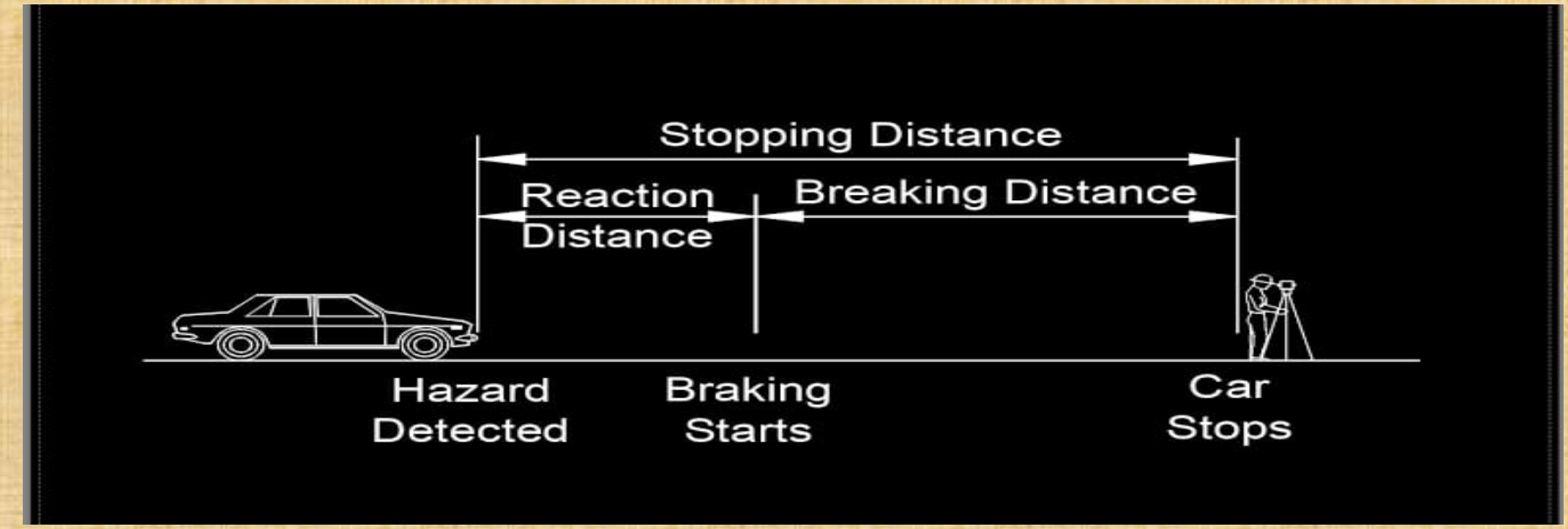
2. Over taking sight distance (OSD) or passing sight distance

3. Intermediate sight distance

1. Stopping sight distance (SSD) or absolute minimum sight distance

It is the minimum sight distance available on road on any spot having sufficient length to enable the driver to stop vehicle traveling with out collision with any obstruction

SSD = Lag distance (Ld) + Breaking distance (Lb)



Lag distance (Ld) “ It is the distance travelled by Vehicle during reaction time (Tr)

Ld = (0.278V) Tr

Reaction time (Tr)

Tr = P + I + E + V = 2.5

P = Perception = Time lost in perceiving the object

I = Intellection = Time lost in understanding the situation

E = Emotion = Time lost due to anger or fear

V = Volition = Time lost in final action

Breaking distance (Lb) “ It is the distance travel by the vehicle after application of brake .

It depends on gradient

Case 1 Rise in gradient Lb = V^2/254(f + s%)

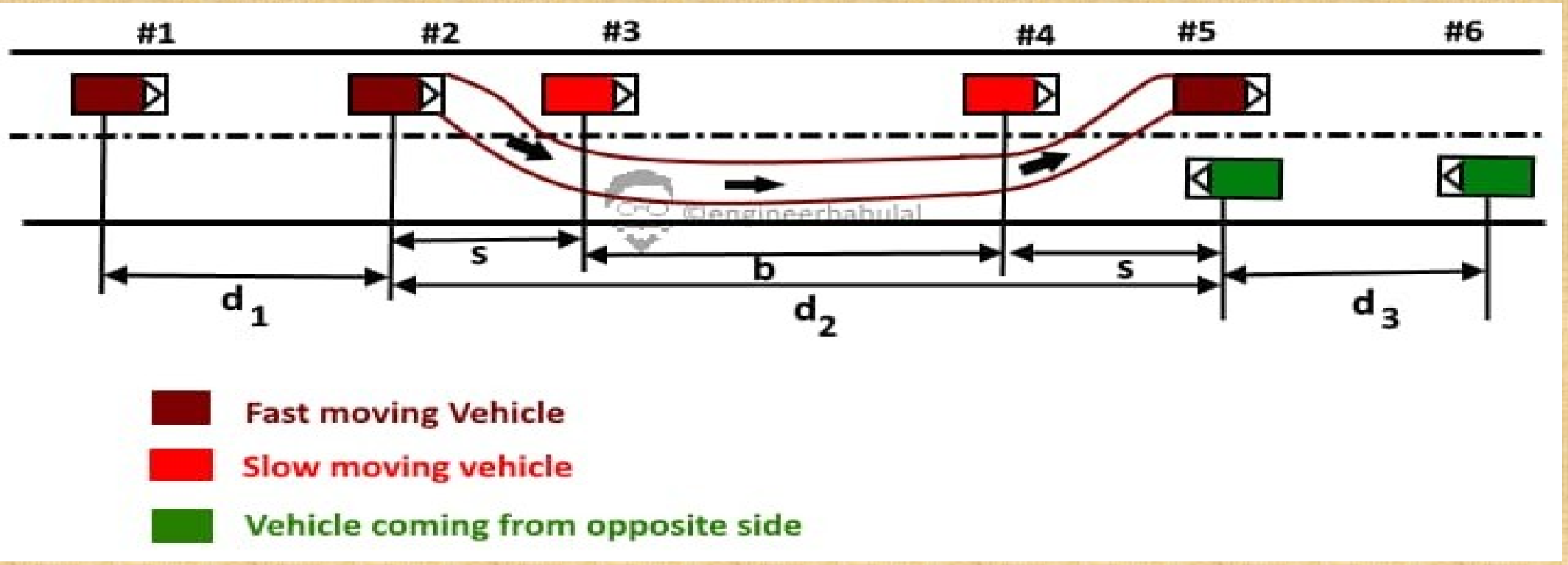
Case 2 fall in gradient Lb = V^2/254(f – s%)

Case 3 flat road (s = 0) Lb = V^/254f

SSD = Ld + Lb
= (0.278)Tr + V^2/254(f s%)

➢Over taking sight distance (OSD)

It is the minimum sight distance open to vision of a driver of vehicle intending to over take slow vehicle ahead safely against traffic in opposite direction.



$$OSD = d1 + d2 + d3$$

$$d1 = Vb \times Tr = (0.278Vb)Tr$$

$$d2 = B + 2s = Vb \times T + 2s = (0.278Vb)T + 2s$$

$$d3 = (0.278Vc)T$$

$$T = 4s/a$$

$$OSD = (0.278Vb)Tr + (0.278Vb)T$$
$$(0.278Vc)T$$

The factors that affect the OSD

1. Velocity of the over taking vehicle , over taken vehicle and of the vehicle coming in the opposite direction

2. Space between vehicle

3. Skill and reaction time of the driver

4. Rate of acceleration of overtaking vehicle

5. Gradient of the road

Intermediate sight distance (ISD)

AT the stretches of the road , where overtaking sight distance cannot be provided as per table given below

ISD = 2 X SSD

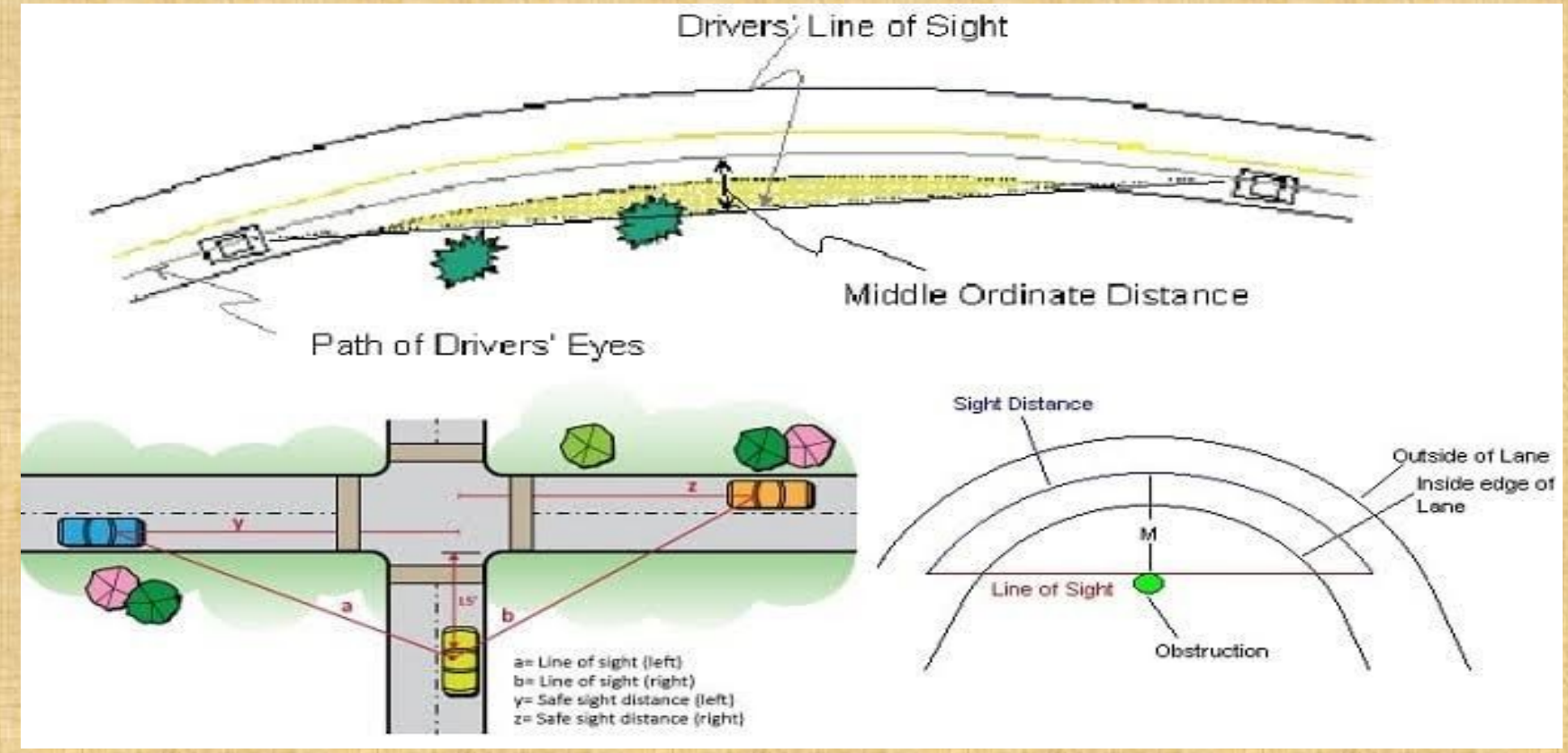
It is the substitute of OSD
SSD < ISD < OSD

Overtaking sight distance on two-lane highways for different speeds

Speed kmph	Time component, seconds			Safe overtaking sight distance (OSD), m
	For overtaking manoeuvre	For opposing vehicle	Total	
40	9.0	6.0	15	165
50	10.0	7.0	17	235
60	10.8	7.2	18	300
65	11.5	7.5	19	340
80	12.5	8.5	21	470
100	14.0	9.0	23	640

SUMMARY

One of the key factor for the safe and efficient operation of vehicles on the road is sight distance . Sight distance ensure overtaking and stopping operation at the right time



REFERENCE

- Figures from Google.
- Transportation Engineering by SK KHANNA, Dr CEG Justo, Dr A Veeraragavan.
- civilengineeringnotes.com
- Transportation Research Board of the National Academy of Sciences.